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Preplanting Ground Treatment Tests for white pine in southeastern Ohio

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THE AUTHORS

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DAVID T. FUNK began working with the Forest Service in 1951 on the Nicolet National Forest, immediately after graduating in forestry from Purdue University. His career was soon interrupted by a 4-year hitch in the navy. Then he returned to his native Indiana to earn a master's degree at Purdue. In 1956 Dave was assigned to the Central States Station. He worked on forest management research in the main office at Columbus, Ohio, for 2 years before being transferred to his present position at the Athens, Ohio, Research Center where he specializes in regeneration research.

Preplanting Ground Treatment Tests for white pine in southeastern Ohio

By

Robert W. Merz and David T. Funk

On an old field in southeastern Ohio eastern white pine[1/] survived and grew as well where planted without ground preparation as it did where any of 4 ground treatments was used. Also, machine planting gave as good results as hand-planting methods.

When site preparations are used, planting costs are increased by 20 to 90 percent. Similarly, hand planting is more expensive than machine planting. The fact that the cheapest combination of techniques tested--machine planting with no ground treatment--was satisfactory should be encouraging to tree planters in southeastern Ohio. Use of the most economical methods will hasten the return to usefulness of thousands of acres of idle land in this section of the State.

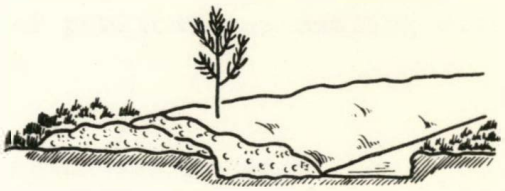
1/ Common names according to Little (2). Scientific names on page 8.

THE STUDY[2]

The area selected for the study was a field typical of many upland tree-planting sites in southeastern Ohio. The texture of the surface soil ranged from silty clay loam to clay loam and the subsoil from silty clay loam to clay. Sheet and gully erosion were common on some of the steeper slopes but were limited to only small portions of the study area. The low cover was chiefly weeds and grasses common to old fields in this area. There was practically no bluegrass sod or similar low, dense cover. And there were only a few clumps of blackberry and a scattered stand of flowering dogwood and sassafras. None of this vegetation was judged dense enough to limit the survival and growth of the planted trees.

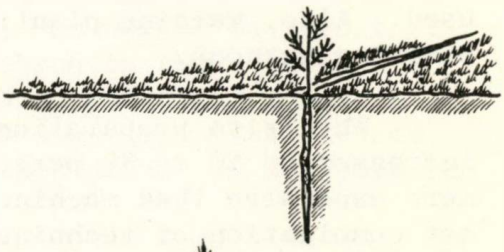
Three 380- by 198-foot blocks were planted in 1949 to eastern white pine.[3] Four site treatments were made before planting:

1. Double furrows.--Made with a two-bottom plow. Trees were planted on the "lay" of the double furrow.

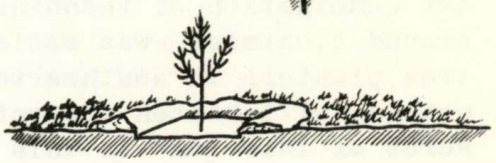


2. Single furrows.--Plowed with a single-bottom plow. Trees were planted in the bottoms of the furrows.

3. Rips.--Made to a maximum depth of 28 inches to loosen the subsoil. Trees were planted in the rips.



4. Scalps.--Made by removing a 2-foot square of sod with a mattock where each tree was to be planted.



2/ This study was made in cooperation with the Ohio Power Company, The Muskingum Watershed Conservancy District, and Ohio University.

3/ Five-year results of a similar study on yellow-poplar were published in 1955 (3).

Trees were also planted in untreated plots in each block for comparison.

There were 4 treated plots and 1 check plot in each block. Each plot was subdivided into 3 subplots for testing 3 methods of planting: Bar, mattock, and machine. Thus, there were 3 blocks of 15 subplots or a total of 45 subplots.

Surface soil (A horizon) depths were measured in each subplot and average depths were computed. These data were considered in evaluating the survival and growth results.

The actual costs of this planting were higher than normal because of the experimental nature of the operation. The relative costs, however, indicate that ground preparations increase costs from 20 to 90 percent; and hand planting costs from 20 to 50 percent more than machine planting. In all cases bar planting was cheaper than mattock planting, and scalping was the most costly ground preparation.

THE RESULTS

In order to arrive at a realistic evaluation of survival and growth, only the trees that were expected to mature were considered. These were called "thrifty" and were distinguished by having normal color, needle length, and height. "Unthrifty" trees were usually suppressed and many had short needles of abnormal color. Moreover, many of them died each year.

Two-thirds of the living trees were thrifty after 10 years. In terms of the original planting, 44 percent were thrifty, 22 percent were unthrifty, and 34 percent had died. The percentages of thrifty trees by subplots were not affected by site treatment, planting method, or surface soil depth (table 1). Among the 45 subplots, the total survivals varied from 28 to 90 percent and from 26 to 66 percent of the trees planted were thrifty, but the differences were not due to ground preparations or planting methods.

Table 1.--Amount and average height of thrifty trees after 10 years by planting method, site treatment, and surface soil depth[1]

BAR PLANTING

Site treatment	Surface soil depth	Thrifty trees	Average height
	Inches	Percent of total planted	Feet
None	5.5	38	14.6
Scalps	5.7	49	14.7
Single furrows	5.3	45	14.3
Double furrows	5.3	39	15.2
Rips	4.5	49	15.3
Mean	5.3	44	14.8

MATTOCK PLANTING

None	5.7	38	14.5
Scalps	5.0	45	15.5
Single furrows	4.7	43	15.8
Double furrows	6.5	35	14.3
Rips	5.3	45	15.2
Mean	5.4	41	15.1

MACHINE PLANTING

None	6.7	41	16.9
Scalps	6.0	59	15.9
Single furrows	6.3	38	15.3
Double furrows	5.5	47	16.7
Rips	6.3	49	16.1
Mean	6.1	47	16.2

ALL METHODS

None	5.9	39	15.4
Scalps	5.6	51	15.4
Single furrows	5.4	42	15.1
Double furrows	5.8	41	15.4
Rips	5.4	48	15.5
Mean	5.6	44	15.3

[1] Data are the averages of 3 subplots.

After 10 years the thrifty trees averaged 15.3 feet in height while the unthrifty trees averaged only 6.4 feet in height (fig. 1). The average height of all the living trees was 12.5 feet. As with survival, site treatment did not affect height growth. However, in 80 percent of the plots the trees planted by machine were from 0.5 to 1.0 foot taller than those planted by hand methods even after adjusting the heights for differences in surface soil depth. Thus, the cheapest combination, machine planting in the untreated plots, was at least as successful as any of the others tested.

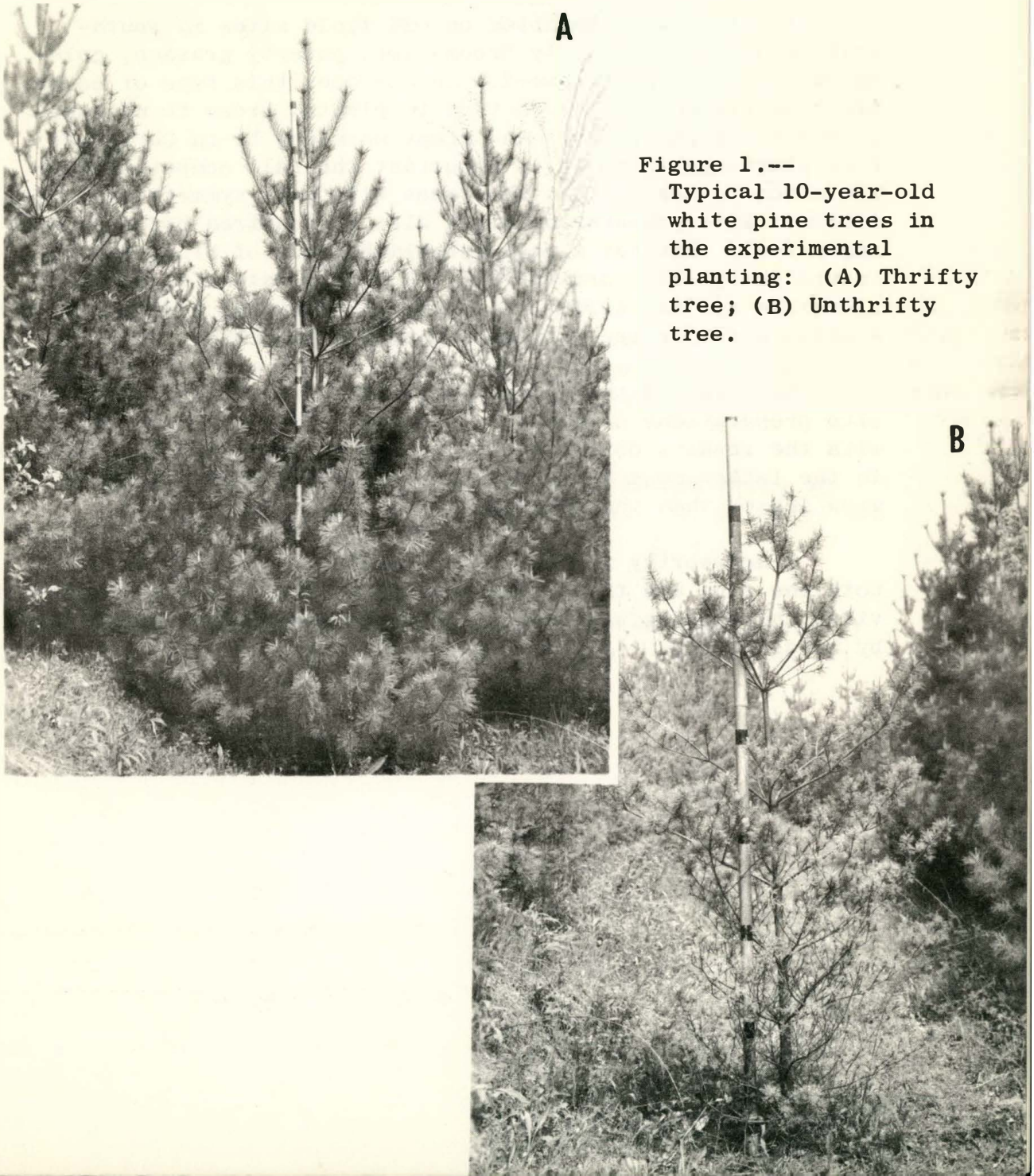


Figure 1.--
Typical 10-year-old white pine trees in the experimental planting: (A) Thrifty tree; (B) Unthrifty tree.

DISCUSSION

Site preparations are made chiefly to remove competing vegetation from the place where a tree is to be planted. The cost of site preparations may account for a fifth to a half of the total planting cost. Merz and Finn (3) found that the costs of 4 different site preparations tested in this study increased the planting cost by at least 20 and by as much as 90 percent. Because of this added cost, site preparations should not be used unless there is evidence that acceptable survival and early growth cannot be achieved without site preparation.

The typical vegetation on old field sites in southeastern Ohio is primarily broomsedge, poverty grasses, goldenrods, asters, and ragweed. Seldom does this type of cover offer severe enough competition to planted trees to necessitate site preparations. An exception might be in Christmas tree plantings where it is important that all competition be minimized to assure that the trees will have symmetrical, full crowns. Site preparation might also be required before planting a field that has a well-established sod of bluegrass to assure acceptable survival (1). However, extensive areas of bluegrass sod are seldom encountered on typical old fields available for reforestation in southeastern Ohio.

Survival of the white pine studied was not affected by site preparations or planting methods. This was consistent with the results obtained with yellow-poplar (3). However, in the latter case the trees planted in the double-furrows grew faster than the others.

A noteworthy result of the planting-method tests with both the pine and the yellow-poplar was that the trees survived and grew as well when planted by machine as when planted by hand.

CONCLUSIONS

White pine survived and grew as well on non-prepared sites as on prepared sites. Furthermore, trees planted by machine survived and grew as well as those planted by hand methods. This substantiates the results from a similar study made with yellow-poplar where machine planting was also successful. It should not be inferred that the results of this study apply to old fields that support a cover of brush species. Fields of this type constitute a special problem that may require unique methods of site preparation to make them plantable.

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COMMON AND SPECIFIC NAMES MENTIONED IN TEXT

TREES

Eastern white pine (*Pinus strobus* L.)

Yellow-poplar (*Liriodendron tulipifera* L.)

Sassafras (*Sassafras albidum* (Nutt) Nees.)

Flowering dogwood (*Cornus florida* L.)

SHRUBS

Blackberry (*Rubus*)

HERBS

Poverty grasses (*Aristida* sp. and *Danthonia* sp.)

Broomsedge (*Andropogon* sp.)

Goldenrods (*Solidago* sp.)

Asters (*Aster* sp.)

Ragweed (*Ambrosia* sp.)

Bluegrass (*Poa* sp.)

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